

B. Tech. (ECE) (Semester – 5th)
INFORMATION THEORY & CODING
Subject Code: BECES1502
Paper ID: [18111321]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

- a) Define entropy.
- b) Give the formula for mutual information.
- c) What do you understand by codeword and prefix codes?
- d) Why there is a need for error control coding?
- e) Explain the term coding gain.
- f) Draw lossless channel.
- g) Enlist various types of codes.
- h) Differentiate between cyclic codes and convolutional codes.
- i) Give one distance property of convolutional codes.
- j) Explain joint probability matrix.

Section – B **(5 marks each)**

Q2. State and prove source coding theorem.

Q3. Construct the Huffman code for following variables:
AAAABBAACCDDDEEEBADEF

Q4. Explain binary erasure and symmetric channels.

Q5. For a systematic [6, 3] linear block code, the parity matrix $[P] = [1 \ 0 \ 1 \ 0 \ 1 \ 1 \ 1 \ 0]$. Find all the possible code vectors.

Q6. Draw and explain convolution encoder connection diagram.

Section – C **(10 marks each)**

Q7. Draw the state diagram, tree diagram and trellis diagram for the $K=3$, $rate=1/3$ code generated by $g_1(X) = X + X^2$; $g_2(X) = 1 + X + X^2$; $g_3(X) = 1 + X$

Q8. Derive the expression for matrix description of linear block codes.

Q9. Explain continuous channels and differential entropy.